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**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

**EX PARTE O'DONNELL**

**Application for Patent**

**Filed: December 27, 1999**

**Serial No. 09/472,757**

**FOR:**

**INSITU POST ETCH PROCESS TO REMOVE REMAINING PHOTORESIST  
AND RESIDUAL SIDEWALL PASSIVATION**

**APPEAL BRIEF**

**CERTIFICATE OF MAILING**

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Signed: \_\_\_\_\_

Sue Funchess

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**(1) REAL PARTY IN INTEREST**

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**(2) RELATED APPEALS AND INTERFERENCES**

None

**(3) STATUS OF CLAIMS**

Claims 1-19 are pending in this application. Claim 16 was withdrawn. Claims 17 and 19 have been withdrawn by the Examiner. Since claims 16, 17 and 19 have been withdrawn, claims 1-15 and 18 are being appealed. Claims 1-16 were submitted with the application as filed. Claim 16 was withdrawn by an election under a restriction requirement. Claims 17 and 18 were added in response to the first Office Action. No amendments to the claims were made in response to the second Office Action. Claim 17 was amended and claims 19-20 were added in the response to the third Office Action. Claim 20 was cancelled and claims 1, 15, 17, and 19 were amended in response to the fourth Office Action. The Examiner withdrew claims 17 and 19 in a fifth Office Action.

All rejections of claims 1-15 and 18 are appealed.

**(4) STATUS OF AMENDMENTS**

No amendments were filed subsequent to the latest final rejection.

**(5) SUMMARY OF INVENTION**

All the claims on appeal are directed at semiconductor-based device processing. More specifically, claims 1-15 and 18 recite a method of etching a metal-containing layer below an etch mask and an apparatus for accomplishing the method. A substrate with a metal-containing layer is placed in etch chamber (step 404 FIG. 4A and page 6, lines 1-2). The metal containing layer is etched away, where some of the metal containing layer is redeposited to form residual sidewall passivation (step 414, page 7 and lines 7-15). The flow of etchant gas is discontinued (step 416, page 7, lines 13-15). A stripping gas is flowed into the etch chamber (step 418 and page 7, lines 16-25). The stripping gas is

used to strip the etch mask and remove most of the sidewall passivation while the substrate is in the etch chamber (steps 420-432 and page 8, line9, to page 9, line 9).

## **(6) ISSUES**

The issues, which Appellant believes to be most pertinent to the present appeal, include:

A) Whether claims 1, 15, and 18 are unpatentable under 35 U.S.C. §102 as being anticipated by Hsieh et al. (US 5,776,832)

B) Whether claims 2-14 are unpatentable under 35 U.S.C. §103 as being obvious over Hsieh et al. (US 5,776,832) and Fukuyama et al. (US 5,770,100) in view of Tepman et al. (US 5,186,718).

## **(7) GROUPING OF THE CLAIMS**

The rejected claims do not stand or fall together, and will be argued separately. The following claim groups will be argued separately.

- I. 1, 15
- II. 2, 3
- III. 4, 5, 6, 12, 13,
- IV. 7, 8, 9, 10
- V. 11
- VI. 14
- VII. 18

## **(8) ARGUMENTS**

### **35 U.S.C. §102 Rejection of Claims 1, 15, and 18 under Hsieh (US 5,776,832)**

The Examiner stated that Hsieh teaches applying a photoresist to a substrate, which is exposed through an etch mask 20 and forming the etch mask over portions of a metal layer 18 where the metal conducting lines are desired (column 4, line 60-column 5, line 2), which the Examiner stated reads on a method of etching partially through a metal-containing layer disposed above a substrate, wherein part of the said metal-containing

layer is disposed below an etch mask and part of said metal-containing layer is not disposed below the etch mask and part of said metal-containing layer is not disposed below the etch mask, where the method comprises anisotropically plasma etching the metal layer in a reactive ion etcher (col. 5, lines 9-17) by using a chlorine-containing gas or gas mixtures such as  $\text{BCl}_3$  and  $\text{Cl}_2$ , which results in the formation of  $\text{AlCl}_3$  on Al sidewalls (col. 3, lines 9-13) and metal side polymer (col. 3, lines 24-26), which the Examiner stated reads on the steps of:

placing the substrate in the etch chamber;

flowing the etchant gas into the etch chamber;

creating a plasma from the etchant gas in the etch chamber; and

etching away parts of the metal-containing layer not disposed below the etch masks, wherein some of the etched away parts of the metal-containing layer is redeposited to form residual sidewall passivation while the substrate is in the etch chamber.

The Examiner further stated that Table 1 shows the etching flow rate and time of the etching gases are set at zero when oxygen ashing is being carried out (col. 5, lines 29-48), which the Examiner states reads on,

discontinuing the flow of the etchant gas into the gas chamber.

The Examiner further stated that in-situ oxygen plasma ashing is carried out in the same etching chamber after etching the metal lines and prior to removing the wafers (col. 3, lines 16-19) and under pressure using pure oxygen and at a flow rate specified in Table 1 (col. 5, lines 53-56). The Examiner stated that this in-situ oxygen ashing in the same etching chamber passivates the aluminum sidewalls by reducing chlorine on aluminum sidewalls with oxygen and partially strips the photoresist (col. 3, lines 17-21 and 24-25), which the Examiner states reads on:

flowing the etch mask stripping gas in the etch chamber;

creating a plasma from the etch mask stripping gas into the etch chamber;

and

stripping away the etch mask and removing some residual sidewall passivation, while the substrate is in the etch chamber; and

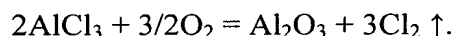
removing the substrate from the etch chamber.

The Examiner argues that the Hsieh method of ashing the aluminum sidewalls is the same as the applicant's residual sidewall passivation and passivates the layer by reducing chlorine on the aluminum sidewalls with oxygen, which would result in a passivated (aluminum oxide) layer which is free of  $\text{AlCl}_3$  and thereby reads on removing some residual sidewall passivation.

### **Group I (Claims 1, 15) Argument**

Hsieh does not teach the step of stripping away the etch mask and removing most of the residual sidewall passivation, while the substrate is in the etch chamber, as recited in claims 1 and 15. Nothing in Hsieh discloses removing most sidewall passivation, while the substrate is in the etch chamber. The Hsieh method of ashing is not the same as the removal of most of the sidewall passivation, as claimed. Column 3, lines 19-24, and column 6, lines 35 to 41, of Hsieh state that the oxygen ashing step strips photoresist and builds up sidewall passivation. The applicant agrees that the ashing step of Hsieh strips photoresist but Hsieh does not remove most sidewall passivation, but instead adds more passivation. Col 3, lines 19-24, of Hsieh states that the oxygen ashing passivates the aluminum sidewalls by reducing the chlorine on the aluminum sidewalls and forming a non-volatile deposition on the sidewalls. Therefore Hsieh teaches reducing the chlorine with oxygen, instead of removing parts of the metal containing layer that are redeposited to form sidewall passivation.

On page 9 of paper number 16, the Examiner further assumes the following reaction,



The Examiner stated that this is the reaction of the oxygen ashing of Hsieh and may be used to show that the sidewall passivation is removed by transforming  $\text{AlCl}_3$  to  $\text{Al}_2\text{O}_3$ .

The applicant disagrees, in that the metal containing part of the sidewall passivation is not removed, but remains in a different molecular form. Page 2, lines 20-25, of the specification states that when aluminum residue is exposed to oxygen, aluminum oxide is formed, which tends to be difficult to remove in a conventional strip chamber and that this aluminum oxide residue forms "bat ears" 26 (FIG. 2). The

above chemical reaction in Hsieh does not remove the bat ears, but instead increases the aluminum oxide, which makes them more difficult to remove.

In addition, Hsieh does not teach the etching away parts of the metal-containing layer not disposed below the etch mask, where some of the etched away parts of the metal-containing layer is redeposited to form residual sidewall passivation. Instead, during the etch the  $\text{Cl}_2$  etchant gas combines with the Al interconnects to form  $\text{AlCl}_3$  on the Al sidewalls (col. 3, lines 12-15 of Hsieh). No mention is made of part of the metal layer being redeposited to form residual sidewall passivation in Hsieh. Instead, Hsieh teaches that chlorine combines with the aluminum on the surface of the aluminum interconnects to form  $\text{AlCl}_3$ . The aluminum on the surface of the aluminum interconnects is not redeposited parts of the metal-containing layer, as recited in claims 1 and 15.

In addition, the formation of passivation, disclosed by Hsieh, is formed during the oxygen plasma ashing, where the oxygen plasma reduces the chlorine on the Al and forms a non-volatile deposition on the Al to passivate the surface of the aluminum (col. 3, lines 19-24 of Hsieh). Therefore, Hsieh teaches the formation of passivation during the oxygen ashing, not during the etching as recited in claims 1 and 15.

In addition, the passivation of Hsieh is undesirable, since the conversion of  $\text{AlCl}_3$  to  $\text{Al}_2\text{O}_3$  occurs on the outer surface of the  $\text{AlCl}_3$ . Hsieh is able to use zero bias during ashing, since the Al in Hsieh is not redeposited parts of the metal-containing layer, but actually is the aluminum interconnects. Hsieh uses zero bias so that the aluminum in the  $\text{AlCl}_3$  is not removed, since removal of the Al part of the  $\text{AlCl}_3$ , would etch away the aluminum interconnect. Since Hsieh does not remove Al, the oxygen reaches mainly the surface of the  $\text{AlCl}_3$ . If the  $\text{AlCl}_3$  is thick and only the surface is converted to  $\text{Al}_2\text{O}_3$ , chlorine may be trapped under the layer of  $\text{Al}_2\text{O}_3$ , which could cause further degradation of the aluminum interconnect.

For at least these reasons, claims 1 and 15 are not anticipated by Hsieh.

#### **Group VII (Claim 18) Argument**

Claim 18 is dependent on claim 1 and further recites accelerating oxygen plasma to the substrate to remove parts of the metal-containing layer that are redeposited to form sidewall passivation. Col. 3, lines 19-24, of Hsieh states that the oxygen ashing passivates the aluminum sidewalls by reducing the chlorine on the aluminum sidewalls. Therefore Hsieh teaches reducing the chlorine with oxygen,

instead of accelerating oxygen to remove parts of the metal containing layer that are redeposited to form sidewall passivation.

In addition, Table 1 and col. 5, lines 49-53, of Hsieh teach that during the oxygen ashing there is zero bias. A bias would be used to accelerate oxygen to the substrate. Since Hsieh teaches zero bias during ashing, Hsieh does not teach accelerating oxygen plasma to the substrate. In addition, even if Hsieh possibly taught some bias, Hsieh would not teach a bias sufficient to remove parts of the metal-containing layer that are redeposited to form sidewall passivation, since Hsieh does not teach removing parts of the metal-containing layer that are redeposited. For at least these reasons, claim 18 is not anticipated by Hsieh.

**35 U.S.C. §103 Rejection of Claims 2-14 under Hsieh (US 5,776,832) in view of applicant's admitted prior art and Fukuyama (US 5,770,100) and further in view of Tepman et al. (US 5,186,718)**

**Group II (Claims 2 and 3) Argument**

The Examiner stated that Hsieh fails to teach electrostatically attracting plasma from the etch mask stripping gas to the substrate in the etch chamber, but that Applicant's admitted prior art teaches reactive ion metal etch chambers, in which the wafer is biased to create a potential across the wafer to electrostatically attract the plasma to the wafer citing the specification page 1, lines 27-30, which the Examiner states reads on electrostatically attracting any gas as well as an etch mask stripping gas to the substrate in the etch chamber.

Claim 2 is dependent on claim 1, and further recites the step of electrostatically attracting plasma from the etch mask stripping gas to the substrate in the etch chamber. Table I of Hsieh indicates that during the ashing step (step 3) the DC bias is 0 volts. It would not be obvious to electrostatically attract the plasma to the substrate during the strip during the method taught by Hsieh. Hsieh teaches away from applying such an electrostatic voltage during strip. As shown in Table I, Hsieh applies a bias during the etch, but purposely eliminates such an electrostatic charge during the strip. In addition, the applicant's admitted art does not teach applying an



electrostatic bias during stripping, since the applicant's admitted prior art stated that the prior art did such stripping outside of the etch chamber in a strip chamber. Instead, applicant's admitted prior art teaches using a bias during etching, which is what is taught in Hsieh. Therefore, applicant's admitted prior art adds nothing to Hsieh, regarding claim 2. For at least these reasons, claim 2 is not made obvious by Hsieh in view of applicant's admitted prior art and Fukuyama et al. (US 5,770,100) and further in view of Tepman et al. (US 5,186,718).

Claim 3 is dependent on claim 2 and further recites that the etch chamber is a metal etch chamber. For at least these reasons, claim 3 is not made obvious by Hsieh in view of applicant's admitted prior art and Fukuyama et al. (US 5,770,100) and further in view of Tepman et al. (US 5,186,718).

### **Group III (Claims 4, 5, 6, 12, 13) Argument**

Claim 4 is dependent on claim 3 and further recites that the step of stripping away the etch mask and removing residual sidewall passivation further removes residue from walls of the etch chamber. The Examiner did not cite anything in the cited references that teaches removing residues from walls of the etch chamber. For at least these reasons, claim 4 is not made obvious by Hsieh in view of applicant's admitted prior art and Fukuyama et al. (US 5,770,100) and further in view of Tepman et al. (US 5,186,718).

Claims 5, 6, 12, and 13 are ultimately dependent on claim 4 and for at least this reason are not made obvious by Hsieh in view of applicant's admitted prior art and Fukuyama et al. (US 5,770,100) and further in view of Tepman et al. (US 5,186,718).

### **Group IV (Claims 7-10) Argument**

Claim 7 is ultimately dependent on claim 6 and further recites placing the substrate in a corrosion passivation chamber after the substrate has been removed from the etch chamber and exposing the wafer to a non-plasma high temperature water vapor. Hsieh teaches passivating the chlorine in the etch chamber by reducing the chlorine with oxygen (col. 3, lines 19-21), which in addition to removing the chlorine, passivates the aluminum sidewalls and forms a non-volatile deposition on the

sidewalls. Therefore, Hsieh would teach away from subsequently putting the substrate in a passivation chamber after removing the substrate from the etch chamber and performing a passivation step using water vapor, since the apparatus in Hsieh has already been passivated. For at least these reasons, claim 7 is not made obvious by Hsieh in view of applicant's admitted prior art and Fukuyama et al. (US 5,770,100) and further in view of Tepman et al. (US 5,186,718).

Claims 8-10 are ultimately dependent on claim 7, and further recite additional features, which in combination are not made obvious by Hsieh in view of applicant's admitted prior art and Fukuyama et al. (US 5,770,100) and further in view of Tepman et al. (US 5,186,718). For at least these reasons claims 8-10 are not made obvious by Hsieh in view of applicant's admitted prior art and Fukuyama et al. (US 5,770,100) and further in view of Tepman et al. (US 5,186,718).

#### **Group V (Claims 11) Argument**

Claim 11 is dependent on claim 10 and is allowable for the same reason that claim 10 is allowable. In addition, claim 11 further recites that the step of electrostatically attracting plasma from the etch mask stripping gas comprises the step of biasing the chuck supporting the substrate to the bias power between -10 and -1,000 volts. Hsieh teaches that during the ashing step there is no bias and that the Examiner agrees that Hsieh in view of applicant's admitted prior art and in view of Fukuyama and further in view of Tepman differ in failing to specify the processing variables such as the bias power between -10 and -100 volts during the step of electrostatically attracting the plasma from the etchant gas and stripping gas. The Examiner argues that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Hsieh in view of the applicant's admitted prior art and in view of Fukuyama and further in view of Tepman by employing any variety of operational variables such as temperature and pressure as claimed by the applicant, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

*In re Vaeck* (20 USPQ2d 1438) states that "Where claimed subject matter has been rejected as obvious in view of a combination of prior art references, a proper analysis under § 103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2)

whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have reasonable expectation of success.”

Nothing in the cited references explicitly or by implication suggests that it would be obvious that such a stripping plasma with a bias power between -10 and -1,000 volts would be successful in removing a metal containing passivation layer, as required by *In re Vaeck*. The Examiner failed to point out anything in the cited references that suggests that a stripping plasma with a bias power between -10 and -1,000 would successfully strip a metal containing passivation layer, as required by *In re Vaeck*. In addition, as discussed above regarding claim 2 it would not be obvious under Hsieh to provide any bias during stripping, let alone a bias of between -10 and -1,000 volts. For at least these reasons, claim 11 is not made obvious by Hsieh in view of the applicant’s admitted prior art and in view of Fukuyama and further in view of Tepman.

#### **Group VI (Claims 14) Argument**

Claim 14 is dependent on claim 13 and is allowable for the same reason that claim 13 is allowable. In addition, claim 14 further recites that the step of electrostatically attracting plasma from the etch mask stripping gas comprises the step of biasing the chuck supporting the substrate to the bias power between -10 and -1,000 volts. As discussed above regarding claim 11, Hsieh teaches that during the ashing step there is no bias and the Examiner agrees that Hsieh in view of applicant’s admitted prior art and in view of Fukuyama and further in view of Tepman differ in failing to specify the processing variables such as the bias power between -10 and -100 volts during the step of electrostatically attracting the plasma from the etchant gas and stripping gas. For the reasons discussed above regarding claim 11 and because claim 14 is dependent on claim 13, claim 14 is not made obvious by Hsieh in view of the applicant’s admitted prior art and in view of Fukuyama and further in view of Tepman.

#### **35 U.S.C. §112 Rejection of Claims 17, 19, and 20**

The applicant believes that claims 17, 19, and 20 are not under consideration, since in paper number 16 the Examiner withdrew claims 17 and 19, and in the Response to Office Action in response to paper number 13, claim 20 was canceled.

On page 2 of paper number 16, the Examiner rejected claims 17, 19, and 20 under 35 U.S.C. §112, first paragraph, as containing subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed had possession of the claimed invention.

Regarding claims 17 and 19, on page 10, of paper number 16, the Examiner withdrew claims 17 and 19 from consideration as being directed to a non-elected invention. Therefore, the applicant believes that claims 17 and 19 should not be considered for this rejection. The applicant does not address this as a main issue, since the applicant believes that these claims are withdrawn or canceled and therefore should not be considered. However, the applicant will address the Examiner's rejection, in case such a response is needed.

Regarding claim 17, the Examiner states that, lines 1-3, of claim 17 states "wherein the stripping away the etch mask and removing some residual sidewall passivation, simultaneously strips away the etch mask and removes parts of the metal containing layer that are redeposited to form residual sidewall passivation." The Examiner states that the above portion lacks support. The Response to Office Action filed in response to paper number 13 amended claim 17, so that such a limitation is not longer in claim 17.

Regarding claim 19, the Examiner stated that lines 1-3 of claim 19 states "wherein the stripping away the etch mask and removing some residual sidewall passivation comprises removing metal containing parts of the metal-containing layer that are redeposited to form residual sidewall passivation." Claim 19 was amended in the Response to Office Action to paper number 13, so that such a limitation is no longer in claim 19.

Claim 20 was cancelled by the Response to Office Action to paper number 13.

For these reasons, the applicant believes that the rejection of claims 17, 19, and 20 is improper.

### **Conclusion**

Regarding all the rejections, the cited references fail to teach or suggest elements required in the pending claims. This is true regardless of whether these references are considered alone or combination with one another. In view of the foregoing, it is

respectfully submitted that none of the pending claims are rendered unpatentable by Hsieh in view of the applicant's admitted prior art and in view of Fukuyama and further in view of Tepman.. Accordingly, the pending rejections of all of the claims under 35 U.S.C. § 103 should be reversed.

Respectfully submitted,  
BEYER WEAVER & THOMAS

A handwritten signature in black ink, appearing to read "Michael Lee". The signature is fluid and cursive, with the first name "Michael" written in a larger, more prominent script than the last name "Lee".

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## **(9) APPENDIX**

1. (Once Amended) A method for etching at least partially through a metal-containing layer disposed above a substrate, wherein part of said metal-containing layer is disposed below an etch mask and part of said metal-containing layer is not disposed below the etch mask, comprising the steps of:

placing the substrate in an etch chamber;

flowing an etchant gas into the etch chamber;

creating a plasma from the etchant gas in the etch chamber;

etching away parts of the metal-containing layer not disposed below the etch mask, wherein some of the etched away parts of the metal-containing layer is redeposited to form residual sidewall passivation while the substrate is in the etch chamber;

discontinuing the flow of the etchant gas into the etch chamber;

flowing an etch mask stripping gas into the etch chamber;

creating a plasma from the etch mask stripping gas in the etch chamber;

stripping away the etch mask and removing most of the residual sidewall passivation, while the substrate is in the etch chamber, wherein plasma created by the etch mask stripping gas strips away the etch mask and removes most of the residual sidewall passivation; and

removing the substrate from the etch chamber.

2. The method, as recited in claim 1, further comprising the steps of:

electrostatically attracting the plasma from the etchant gas to the substrate in the etch chamber; and

electrostatically attracting the plasma from the etch mask stripping gas to the substrate in the etch chamber.

3. The method, as recited in claim 2, wherein the etch chamber is a metal etch chamber.

4. The method, as recited in claim 3, wherein the step of stripping away the etch mask and removing residual sidewall passivation further removes residue from walls of the etch chamber.

5. The method, as recited in claim 4, wherein the etch mask stripping gas comprises oxygen.

6. The method, as recited in claim 5, further comprising the steps of:  
  
placing the substrate in a load lock; and  
  
removing the substrate from the load lock to place the substrate into the etch chamber.

7. The method, as recited in claim 6, further comprising the steps of:  
  
placing the substrate into a corrosion passivation chamber after the substrate has been removed from the etch chamber; and  
  
exposing the wafer to a non-plasma high temperature water vapor.

8. The method, as recited in claim 7, further comprising the steps of:

transferring the substrate from the corrosion passivation chamber to a cooling station;

cooling the substrate in the cooling station; and

transferring the substrate from the cooling station to the load lock.

9. The method, as recited in claim 8, further comprising the step of maintaining a pressure between 1 and 80 millitorr during the etching and stripping steps.

10. The method, as recited in claim 9, further comprising the step of maintaining the substrate at a temperature between 10° and 100° C during the etching and stripping steps.

11. The method, as recited in claim 10, wherein the step of electrostatically attracting the plasma from the etchant gas comprises the step of biasing a chuck supporting the substrate to a bias power between -10 and -1,000 volts, and wherein the step of electrostatically attracting the plasma from the etch mask stripping gas comprises the step of biasing the chuck supporting the substrate to a bias power between -10 and -1,000 volts.

12. The method, as recited in claim 4, further comprising the step of maintaining a pressure between 1 and 80 millitorr during the etching and stripping steps.



13. The method, as recited in claim 12, further comprising the step of maintaining the substrate at a temperature between 10° and 100° C during the etching and stripping steps.

14. The method, as recited in claim 13, wherein the step of electrostatically attracting the plasma from the etchant gas comprises the step of biasing a chuck supporting the substrate to a bias power between -10 and -1,000 volts and wherein the step of electrostatically attracting the plasma from the etch mask stripping gas comprises the step of biasing the chuck supporting the substrate to a bias power between -10 and -1,000 volts.

15. (Once Amended) A method for etching at least partially through a metal-containing layer disposed above a substrate, wherein part of said metal-containing layer is disposed below an etch mask and part of said metal-containing layer is not disposed below the etch mask, comprising the steps of:

placing the substrate in the etch chamber;

etching away parts of the metal-containing layer not disposed below the etch mask, wherein some of the etched away parts of the metal-containing layer is redeposited to form residual sidewall passivation on the substrate, while the substrate is in the etch chamber;

using a stripping gas to strip away the etch mask and remove most of the sidewall passivation while the substrate is in the etch chamber; and

removing the substrate from the etch chamber.

16. (Withdrawn) An apparatus for etching at least partially through a metal-containing layer disposed above a substrate, wherein part of said metal-containing

layer is disposed below an etch mask and part of said metal-containing layer is not disposed below the etch mask, comprising:

means for placing the substrate in an etch chamber;

means for flowing an etchant gas into the etch chamber;

means for creating a plasma from the etchant gas in the etch chamber;

means for etching away parts of the metal-containing layer not disposed below the etch mask, wherein some of the etched away parts of the metal-containing layer are redeposited to form residual sidewall passivation while the substrate is in the etch chamber;

means for discontinuing the flow of the etchant gas into the etch chamber;

means for flowing an etch mask stripping gas into the etch chamber;

means for creating a plasma from the etch mask stripping gas in the etch chamber;

means for stripping away the etch mask and removing some residual sidewall passivation, while the substrate is in the etch chamber; and

means for removing the substrate from the etch chamber.

17. (Withdrawn) An apparatus for performing the method, as recited in claim 1.

18. The method, as recited in claim 1, wherein the stripping away comprises accelerating oxygen plasma to the substrate to remove parts of the metal-containing layer that are redeposited to form residual sidewall passivation.

19. (Withdrawn) A semiconductor chip formed by the method, as recited in claim 1.

20. (Canceled).